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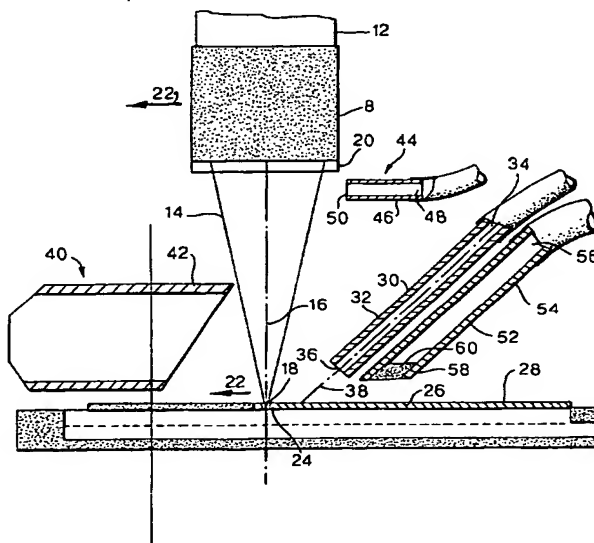
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(54) Title: LASER WELDING METHOD AND APPARATUS FOR SUPPRESSING PLASMA



(57) Abstract: Laser welding apparatus (12), in which a laser beam (14) is impinged upon a component (2) to be welded at a laser beam impingement point (18), wherein plasma suppression means (30) is arranged to impinge a jet of gas on the component (2) at an angle to its surface, flowing towards the laser beam impingement point (18).

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INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER IPC 7 B23K26/14 B23K26/16 B23K26/42		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) IPC 7 B23K		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practical, search terms used) PAJ, EPO-Internal		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	PATENT ABSTRACTS OF JAPAN vol. 1997, no. 01, 31 January 1997 (1997-01-31) & JP 08 238587 A (NISSHIN STEEL CO LTD), 17 September 1996 (1996-09-17)	1,4-8, 11-16, 27,28
Y	abstract	2,3, 17-24
X	EP 1 013 372 A (NIPPON STEEL CORP) 28 June 2000 (2000-06-28)	1,4-9, 11-16, 27,28
Y	paragraphs '0056!', '0057!', '0073!', '0074!; figures 5,111,7,18	2,3, 17-20, 22,23,25
	-/-	
<input checked="" type="checkbox"/> Further documents are listed in the continuation of box C. <input checked="" type="checkbox"/> Patent family members are listed in annex.		
* Special categories of cited documents : *A* document defining the general state of the art which is not considered to be of particular relevance *E* earlier document but published on or after the international filing date *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) *O* document referring to an oral disclosure, use, exhibition or other means *P* document published prior to the international filing date but later than the priority date claimed *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art *G* document member of the same patent family		
Date of the actual completion of the international search		Date of mailing of the international search report
5 September 2003		18/09/2003
Name and mailing address of the ISA European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel (+31-70) 340-2040, Tx. 31 651 epo nl, Fax (+31-70) 340-3016		Authorized officer Jeggy, T

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with Indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 1 103 336 A (RENAULT) 30 May 2001 (2001-05-30)	1,2,4, 6-8, 11-19
A	paragraphs '0003!-'0005!, '0008!, '0022!, '0025!-'0027!, '0030!, '0031!, '0034!-'0037!; figure 1	9
X	EP 0 474 557 A (COMMISSARIAT ENERGIE ATOMIQUE) 11 March 1992 (1992-03-11)	1,2,4-8, 11-17,19
A	column 2, line 40 -column 3, line 34; figure 1	9
Y	PATENT ABSTRACTS OF JAPAN vol. 009, no. 098 (M-375), 27 April 1985 (1985-04-27) & JP 59 223191 A (RYOMEI ENG CORP LTD), 14 December 1984 (1984-12-14) abstract	2,17-22
Y	EP 0 507 268 A (MITSUI PETROCHEMICAL IND ; MIYACHI TECHNOS CORP.) 7 October 1992 (1992-10-07) column 4, line 51 -column 5, line 37; figures 5,6	2,17-20, 22
Y	PATENT ABSTRACTS OF JAPAN vol. 009, no. 179 (M-399), 24 July 1985 (1985-07-24) & JP 60 049887 A (MITSUBISHI MOTORS CORP), 19 March 1985 (1985-03-19) abstract	3,23,24
Y	US 4 303 824 A (J.H. MORGAN ET AL) 1 December 1981 (1981-12-01)	3,23,25
A	column 3, line 45-49	24
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A	the whole document	25

INTERNATIONAL SEARCH REPORT

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Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☒ Claims Nos.: 26
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
see FURTHER INFORMATION sheet PCT/ISA/210
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box I.2

Claims Nos.: 26

Claim 26 is not written in respect with Rule 6 (2) (a) PCT. It is not clear which features of the laser welding apparatus are clearly defined in this claim so that the requirements of the PCT with respect to Article 6 PCT are not fulfilled.

The applicant's attention is drawn to the fact that claims, or parts of claims, relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure.

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PCT/GB 97/02460

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